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Biomass Fuels Program

QUESTIONNAIRE SURVEY ON POTENTIAL PRODUCTION OF AGRICULTURAL CROPS FOR LIQUID FUEL

Tennessee Valley Region

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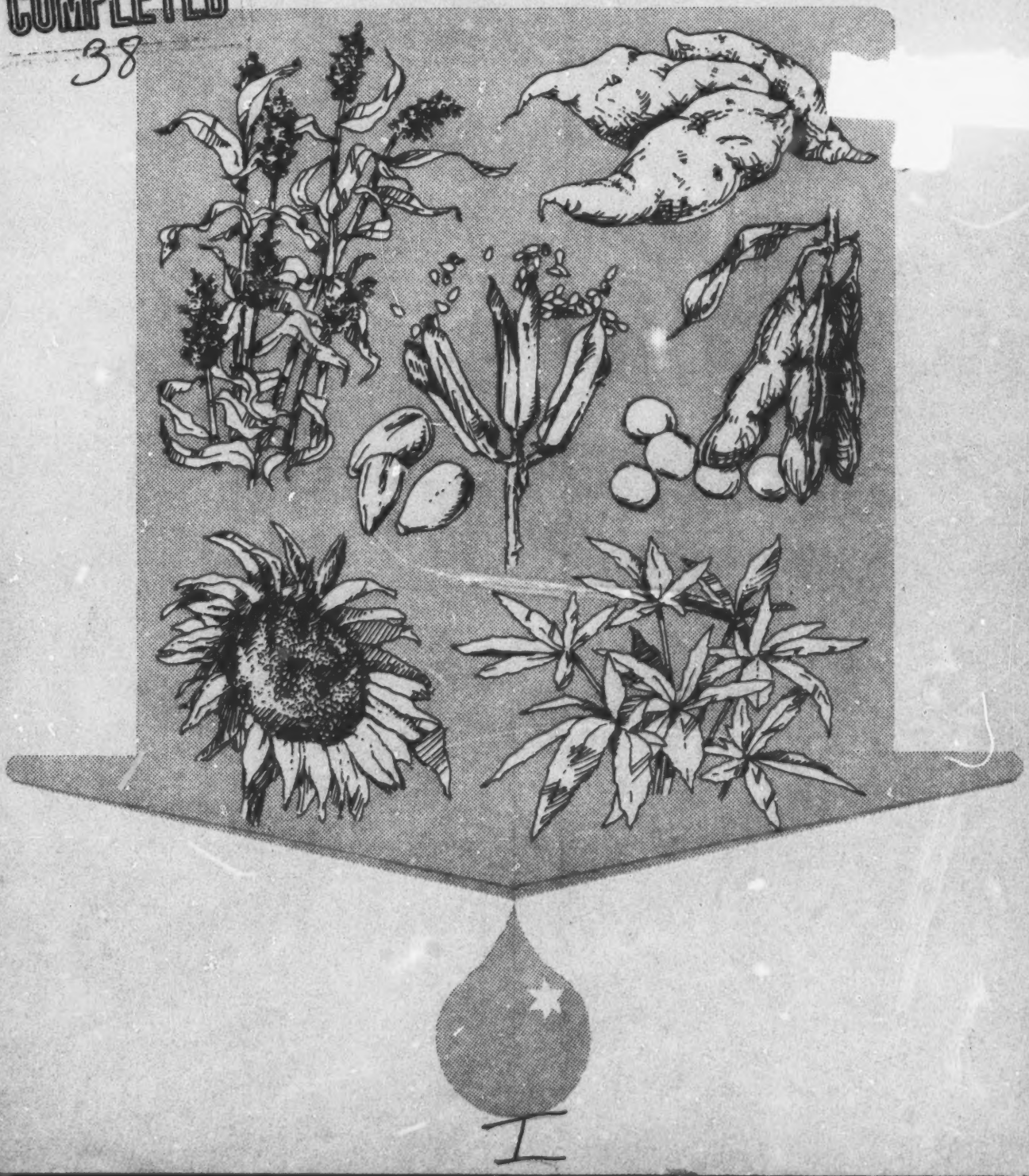

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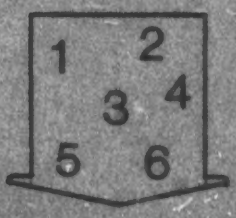

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2. Sweet Potato
3. Sesame
4. Soybean
5. Sunflower
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QUESTIONNAIRE SURVEY ON POTENTIAL PRODUCTION OF AGRICULTURAL CROPS FOR LIQUID FUEL--201-COUNTY TVA REGION

By

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SUMMARY

As one segment of a diversified TVA biomass fuels program, an agricultural land inventory is underway to assess the potentials for production of liquid fuels from agricultural crops in the Tennessee Valley region. Basic information for determining these potentials is derived largely from USDA-SCS land inventories and U.S. agricultural census surveys. As an important supplement to these basic data, however, a questionnaire survey was conducted in the spring of 1981 in cooperation with the State Agricultural Extension Services of the seven Tennessee Valley states. Answers to a number of questions on issues such as farmer attitudes and willingness to make land conversions to biomass fuel crops, present hindrances that farmers might perceive in making these conversions, estimates of underutilized open land, soil erosion concerns, and farmer willingness to be involved in cooperative farm demonstrations, were provided by extension service offices from each of the 201 counties within the TVA watershed and power service area.

A summary of the results of the questionnaire survey is included in this report, and major findings of this study will be incorporated in a later, more comprehensive report on agricultural land availability and potential production of fuel crops in the Tennessee Valley region. In order to intermesh county-accessed data with inherent land characteristics, results of the questionnaire were grouped into geographical subareas of counties which approximate twelve major land resource areas within the TVA region.

Based on responses from local county agricultural agents, present farmer interest in growing crops for alcohol and oil fuels is not very enthusiastic for the 201-county region with today's farm commodity prices and technology. Responses to the questionnaire do, however, indicate substantial interest in possible production of oil seed crops (such as soybeans, sunflowers, and peanuts) to produce oil for on-farm direct combustion in diesel engines. There appears to be relatively more farmer interest in production of fuel crops within land resource areas of the western and central parts of the Tennessee Valley region.

The concern and apprehension in making land use conversions from principally food and fiber crops to fuel crops is primarily related to several perceived hindrances to fuel crop production. "Uncertainty of economic return" and "storage and marketing facilities" were the two greatest hindrance factors reported for the 201-county region surveyed. Other reported serious hindrances to fuel crop production include "investment costs," "availability of on-farm equipment," "production technology," and "farmer interest or preference." Some differences in degree of each of these hindrance factors were expressed among the various land resource areas.

Estimates of openland considered potentially available for fuel crops (without significantly reducing production of food and fiber crops) was conservatively estimated at about one million acres for the 201 counties. A more detailed assessment of such "marginal" agricultural land acreage will be forthcoming in a subsequent report.

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The need for improved soil conservation measures was evident from the survey data, with greatest needs expressed by counties from the western and central areas of the Tennessee Valley region. Significant interest was reported throughout the region in adoption of reduced tillage systems to control soil erosion. A noteworthy conclusion was the consensus that farmers overwhelmingly oppose any government incentive programs tied to soil conservation or restrictions on use of prime farmland in growing crops for fuel use. This attitude is prevalent throughout all land resource areas.

About 56% of the counties surveyed indicated definite knowledge of one or more farmers who would be willing to produce liquid fuel on a cooperative, demonstrational basis with the Agricultural Extension Service and TVA. Expected effectiveness of such farm enterprise demonstrations was estimated as quite high by the survey respondents.

Results of the questionnaire survey should be useful in identifying counties and land resource areas with the maximum potential effectiveness of crop production demonstrations and farm-scale liquid fuel production units. The responses received from county agricultural leaders point out some of the present economic problems and concerns which exist on farms in the region, and offer some specific challenges to researchers, educators, and developers of farm policy. One or more technological "breakthroughs" in conversion of plant biomass to liquid fuel, or a sudden increase in cost or scarcity of petroleum-based energy, could drastically reduce these present concerns expressed at the county level for production of fuels from agricultural crops. An easing of the

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financial crisis most farmers are currently experiencing (due to high interest rates and a tight cost-price squeeze) would probably also help stimulate interest in production of liquid fuel crops in the Tennessee Valley region.

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QUESTIONNAIRE SURVEY ON POTENTIAL PRODUCTION OF AGRICULTURAL CROPS FOR LIQUID FUEL--201-COUNTY TVA REGION

J. M. Soileau

INTRODUCTION AND BACKGROUND

With decreasing availability and increasing costs of conventional fossil fuels, there is growing interest in fuel production from plant biomass sources. TVA, with cooperation and assistance from several agencies, has recently initiated a biomass fuels program of research and demonstration. As one segment of this diversified biomass program, an agricultural land inventory is being made to assess the potentials for production of liquid fuels from agricultural crops in the Tennessee Valley region.

In order to evaluate the feasibility of using agricultural land for fuel crop production, it is necessary to determine existing agricultural land use, crop production potentials, suitability and availability of land resources, and present farm consumption of fuels. The Crop Reporting Service, Agricultural Census surveys, and National Land Resources inventories provide considerable data of this nature at the county and state levels. However, certain kinds of information, such as the interest and capability of farmers to make cropping system conversions possibly required in future fuel crop production, can only be obtained through special studies.

As one of these special studies within the cropland assessments project, a questionnaire survey was conducted in cooperation with the State Agricultural Extension Services of each of the 7 states within the

Tennessee Valley region. During the spring of 1981 a two-page questionnaire survey form (appendix A) was sent to each of the county extension service offices of the 201 counties within the TVA watershed and power service area. A number of questions were answered by the extension agent or other local agricultural officials regarding such issues as farmer attitudes and willingness to make land conversions to biomass fuel crops, present hindrances that farmers perceive in making these conversions, estimates of underutilized open land, soil erosion problems, and farmer willingness to be involved in cooperative farm demonstrations. This report summarizes results of the questionnaire survey. Major findings of this survey will be included in a later more comprehensive report on agricultural land availability and potential production of fuel crops in the Tennessee Valley region.

GEOGRAPHICAL GROUPINGS

Survey data from the county questionnaires were grouped into 12 geographical subareas which approximate the major land resource areas within the 201-county region (see figures 1 and 2). This type of grouping allows for a meshing of county-accessed agricultural census and other crop survey data with land capability data based on inherent soil characteristics. Since land resource areas are characterized by a particular related combination or pattern of soils, climate, water resources, land use, and types of farming, they are useful delineations to use in comparing agricultural potentials from one geographic area to another. The proportion of the total 201-county TVA land region occupied

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by each of the 12 major land resource areas (county approximations) is shown in table 1.

RESULTS

A summary of survey responses to 11 multiple choice questions is given in table 2 for the 201-county region, as well as by land resource areas. Responses were obtained from 200 of the 201 counties surveyed, but the total number of answers varied somewhat among the questions asked (see table 2).

Amount of farmer interest

With present-day farm commodity prices and technology, only about 15% of the 200 responding counties estimated moderate to much farmer interest in growing crops such as sweet sorghum, sweet potatoes, sugarbeets, and oil seed crops for liquid fuel production (question 1, table 2). However, when addressed specifically to vegetable oil crops, 44% of the counties estimated moderate to much interest among farmers for growing crops such as soybeans, sunflowers, and peanuts to produce oil for on-farm direct combustion in diesel engines (question 8, table 2). There appears to be above-average interest in production of oil seed crops for diesel engine use in the Blackland Prairies (LRA 135), Nashville Basin (LRA 123), Southern Coastal Plains (LRA 133), Southern Mississippi Valley Silty Uplands (LRA 134), and Highland Rim (LRA 122) regions (question 8, table 2). Although the sample size may be too small to be very meaningful, all four responding counties in the Blackland Prairies (LRA 135) indicated moderate to much farmer interest in both alcohol and vegetable oil type crops (question 1, table 2).

Although there appears to be significant interest by farmers in considering crops for liquid fuel use, there is currently much farmer apprehension in making land use conversions from conventional food and fiber to liquid fuel crops. As indicated by the response shown in table 2 (question 2), about 87% of the counties estimated that even with future advancements in technology and commodity price changes, farmers would not convert from conventional food and fiber to liquid fuel crops unless there was a net income advantage of at least 25%. Land resource areas which estimated greater farmer willingness to make land conversions to liquid fuel crops with less than 25% net income advantages included Southern Mississippi Valley Silty Uplands (LRA 134) and Blackland Prairies (LRA 135).

Farmer-perceived hindrances to fuel crop production

In order to try to determine what are the major concerns that farmers have with respect to growing crops primarily for liquid fuel production, each county was asked to estimate the degree of hindrance (slight, moderate, or severe) for six possible farmer concern factors (question 3, table 2). For the entire 201-county region, "uncertainty of economic return" and "storage and marketing facilities" were the two greatest hindrances factors--both received a "severe" rating from 71 to 75% of the counties. In addition, all of the other listed factors: "investment costs," "availability of on-farm equipment," "production technology," and "farmer interest or preference," were rated moderate to severe hindrances in 78 to 95% of the counties. Another serious hindrance factor frequently mentioned by counties in the Blue Ridge Mountains (LRA 130) was "availability of cropland."

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"Uncertainty of economic return" was estimated as a particularly severe hindrance factor in North Alabama Limestone Valley (LRA 128a) and the Nashville Basin (LRA 123). "Storage and marketing facilities" was listed as a particularly severe hindrance in Sand Mountain (LRA 129), Nashville Basin (LRA 123), and North Alabama Limestone Valley (LRA 128a). Of various land resource areas, the problem of "availability of on-farm equipment" was estimated to be most severe in the Nashville Basin (LRA 123) and Highland Rim (LRA 122) counties.

Availability of openland

In order to supplement land capability and crop acreage data obtained from the Soil Conservation Service and the Agricultural Census, a question (no. 4, table 2) was asked in the survey regarding the amount of unused or underutilized openland (land potentially available for biomass crop use) in each county. Information provided by this survey, together with the other mentioned land inventory data, should help identify areas with much "marginal" or otherwise underused land capable and/or available for growing fuel crops without significantly reducing production of conventional food and fiber crops. For the 201-county region, about 40% of the counties were estimated to have less than 2,000 acres of unused or underused openland available for biomass crops, while 41% had an estimated 2,000 to 8,000 acres within this land category. Counties which reported more than 8,000 acres of unused/underused openland were proportionally most prevalent in the Nashville Basin (LRA 123) and Blackland Prairies (LRA 135) subregions.

Using the mid-point values of acreage ranges and percentage distribution of the respective categories (question 4, table 2) approximately one million acres of unused/underused openland were estimated available for conversion to fuel crops within the 201 counties surveyed. In view of the latest available (1978) agricultural census data suggesting 3.2 million acres of openland in "low intensity" useage on farms of the 201-county region, the questionnaire survey estimate is probably very conservative.

Soil conservation issues

The survey contained four questions relating to the need for more soil conservation management on farm land and farmer receptivity to government incentive programs tied with soil-conserving land use restrictions.

Most of the counties surveyed (79%) reported that only 10 to 50% of the farmers in their counties were practicing adequate soil conservation (question 9, table 2). Higher proportions of the farmers in the Blackland Prairies (LRA 135), Southern Mississippi Valley Silty Uplands (LRA 134), Southern Coastal Plain (LRA 133), and Highland Rim (LRA 122) subregions were estimated to be in need of improvements in soil conservation practices.

The interest of farmers in adoption of crop management systems involving reduced tillage of row crops was considered moderate to much in 86% of the 196 counties responding to this question (question 10, table 2). The greatest interest in adoption of such practices was suggested in the following land resource areas: Highland Rim (LRA 122), Nashville Basin (LRA 123), Sand Mountain (LRA 129), and Southern Mississippi Valley Silty Uplands (LRA 134).

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The general consensus was that farmers overwhelmingly oppose any government incentive programs tied to soil conservation or restrictions on use of prime farmland in growing crops for fuel use (questions 5 and 6, table 2). This attitude is prevalent throughout all land resources areas.

Interest in cooperative farm demonstrations

On the question of expected effectiveness of farm enterprise demonstrations in promoting crops for liquid fuel production, 80% of the respondent counties estimated the probability as moderate to high (question 7, table 2). The expected effectiveness of such farm demonstrations was estimated to be considerably lower in the Blue Ridge (LRA 130) than the other land resource areas within the Tennessee Valley region. The problem of availability of suitable cropland in the mountainous Blue Ridge region is probably the main reason for the lower expected value of farm demonstrations in these counties.

Results of a "yes" or "no" question pertaining to knowledge by respondents of any farmers in their county who would be interested in producing fuel on a cooperative, demonstrational basis showed 56% "yes" and 44% "no" responses (question 11, table 2). Above average "yes" responses came from the Nashville Basin (LRA 123), Sand Mountain (LRA 129), and Blackland Prairies (LRA 135) counties. A rough estimate of the total number of actual farmer prospects for such cooperative demonstrations was about 240 for the 107 counties which reported positively to the question.

Other comments by respondents

A number of respondents included specific comments regarding the potential production of agricultural crops for liquid fuel. As indicated by the questionnaire form shown in appendix A, space was provided for specific comments in questions 1, 3, and 12. A list of the more pertinent comments is given in appendix B.

Consistent with the questionnaire results shown in table 2, the comments in appendix B indicate universal farmer concern in such areas as marketing, financial assistance, economic returns, production technology, and availability of land and equipment related to production of liquid fuel crops. There also appears to be much variation in interest in such crops among counties and land resource areas. Presently there is only a small scattering of farmers within the Tennessee Valley region who are actually engaged in production of alcohol or vegetable oil for on-farm use, but there appears to be considerable interest in establishment of farm demonstrations on crop production and farm-scale liquid fuel production units throughout much of the 201-county region.

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Table 1. Distribution of land by major land resource areas (county approximations), 201-county Tennessee Valley region.[1/]

Land resource area (LRA)	Description	Total land within LRA's		Inventory (Agricultural Base) Land[2/]	
		Acreage	Percent of total land area	Acreage	Percent
		('000)		('000)	
120	Kentucky and Indiana Sandstone and Shale Hills and Valleys	806	1.4	738	91.5
122	Highland Rim	9,242	15.8	8,417	91.1
123	Nashville Basin	3,480	5.9	3,152	90.6
125	Cumberland Plateau and Mountains	4,629	7.9	4,390	94.8
128	Southern Appalachian Ridges and Valleys	10,166	17.4	8,482	83.4
128a	North Alabama Limestone Valley	2,504	4.3	2,181	87.1
129	Sand Mountain	2,250	3.8	2,029	90.2
130	Blue Ridge Mountains	5,926	10.1	4,017	67.8
131	Southern Mississippi Valley Alluvium	519	0.9	501	96.4
133	Southern Coastal Plain	10,314	17.6	9,478	91.9
134	Southern Mississippi Valley Silty Uplands	7,059	12.1	6,524	92.4
135	Blackland Prairies	1,615	2.8	1,491	92.3
	Total Tennessee Valley region	58,508	100.0	51,399	87.8

[1/] Based on 1967 USDA Soil Conservation Service data obtained from published state CNI reports.
[2/] Includes cropland, pasture, forest, and other rural land, but excludes federal non-cropland, urban and builtup >10 acres, and water <40 acres. Percent based on total land within LRA.

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Table 2. Results of county questionnaire survey on production of agricultural crops for liquid fuel, 201-county Tennessee Valley Region, 1981.

Question-answer category	Percentage of times a particular answer was selected within each land resource area: 122[1]	123	125	128	128a	129	130	133	134[2]	135	201-county region	Total No. of counties responding
Question 1: In your best judgement, with present-day farm commodity prices and technology, how much interest is there among farmers of your county in growing crops such as sweet sorghum, sweet potatoes, sugarbeets, and oil seeds for liquid fuel (alcohol and vegetable oil) production?												
Answers:												200
A. None	21.1	33.3	6.7	15.4	0.0	16.7	32.0	10.0	8.0	0.0	17.0	
B. Slight	68.4	58.3	80.0	69.2	83.3	83.3	64.0	66.7	80.0	0.0	68.5	
C. Moderate	10.5	8.3	13.3	15.4	16.7	0.0	4.0	20.0	8.0	50.0	12.5	
D. Much	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	4.0	50.0	2.0	
Question 2: Assuming future advancements in technology and farm commodity price changes, how much more net income per acre would be required for most farmers in your county to convert their present cropland from conventional food and fiber crops to liquid fuel crops?												
Answers:												199
A. Same	5.3	0.0	7.1	2.6	0.0	0.0	4.0	0.0	4.0	0.0	2.5	
B. 10% more	5.3	8.3	7.1	7.7	0.0	0.0	12.0	13.3	16.0	50.0	10.1	
C. 25% more	57.9	75.0	42.9	51.3	50.0	66.7	36.0	50.0	44.0	50.0	50.8	
D. 50% more	28.9	8.3	42.9	33.3	33.3	16.7	32.0	30.0	32.0	0.0	29.6	
E. 100% more	2.6	8.3	0.0	5.1	0.0	0.0	12.0	3.3	4.0	0.0	4.5	
F. (Other)	0.0	0.0	0.0	0.0	16.7[3]	16.7[4]	4.0[5]	3.3[3]	0.0	0.0	2.5	

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Table 2 (continued)

Question-answer category	Percentage of times a particular answer was selected within each land resource area: 122[1]	123	125	128	128a	129	130	133	134[2]	135	201-county region	Total No. of counties responding
Question 4: In your best judgement, how much unused or underused openland in your county is suitable and available for production of fuel crops?												
Answers:												200
A. <2,000 acres	26.3	33.3	53.3	35.9	33.3	50.0	72.0	36.7	44.0	0.0	40.5	
B. 2,000-8,000 acres	60.5	16.7	26.7	46.2	16.7	50.0	24.0	40.0	44.0	50.0	41.0	
C. 8,000-15,000 acres	10.5	25.0	13.3	17.9	50.0	0.0	4.0	23.3	4.0	25.0	14.5	
D. 15,000-25,000 acres	2.6	16.7	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	
E. 25,000-40,000 acres	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	8.0	25.0	2.0	
Question 5: Approximately what proportion of farmers in your county would be receptive to government incentive programs that would encourage the production of liquid fuel crops on cropland, with certain soil-conserving restrictions?												
Answers:												198
A. 10%	15.8	41.7	40.0	44.7	16.7	33.3	37.5	30.0	32.0	0.0	31.8	
B. 25%	63.2	25.0	33.3	42.1	33.3	50.0	45.8	36.7	36.0	25.0	42.9	
C. 50%	15.8	8.3	20.0	7.9	33.3	16.7	8.3	26.7	28.0	50.0	17.7	
D. 75%	2.6	16.7	0.0	2.6	0.0	0.0	0.0	6.7	4.0	25.0	4.0	
E. (Other)	2.6[6]	8.3[6]	6.7[6]	2.6[7]	16.7[8]	0.0	8.3[6]	0.0	0.0	0.0	3.5	
Question 6: Approximately what proportion of farmers in your county would be receptive to government incentive conservation and production programs that would allow for use of steeper, more erosive, or less productive land for fuel crops, while preventing the planting of fuel crops on prime farmland?												
Answers:												197
A. 10%	21.1	54.5	40.0	50.0	33.3	16.7	44.0	33.3	37.5	50.0	37.4	
B. 25%	42.1	27.3	20.0	26.3	0.0	50.0	16.0	33.3	29.2	25.0	28.8	
C. 50%	23.7	18.2	20.0	21.1	50.0	33.3	28.0	16.7	20.8	25.0	23.2	
D. 75%	5.3	0.0	13.3	0.0	0.0	0.0	0.0	16.7	4.2	0.0	5.1	
E. (Other)	7.9	0.0	6.7	2.6	16.7	0.0	12.0	0.0	8.3	0.0	5.6	

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Table 2 (continued)

Question-answer category	Percentage of times a particular answer was selected within each land resource area: 122[1]	123	125	128	128a	129	130	133	134[2]	135	201-county region	Total No. of counties responding
Question 3: At the present time, how important are each of the following factors as a hindrance for growing crops for liquid fuel production in your county?												
Answers:												
A. Farmer interest or preference												189
1. Slight hindrance	27.0	33.3	20.0	30.8	16.7	50.0	26.1	26.7	12.0	33.3	21.7	
2. Moderate hindrance	67.6	50.0	73.3	41.0	66.7	33.3	43.5	50.0	60.0	66.7	57.7	
3. Severe hindrance	5.4	16.7	6.7	28.2	16.7	16.7	30.4	23.3	28.0	0.0	20.6	
B. Uncertainty of economic return												195
1. Slight hindrance	5.3	8.3	6.7	2.6	0.0	16.7	0.0	0.0	0.0	33.3	3.6	
2. Moderate hindrance	23.7	0.0	40.0	23.7	0.0	16.7	38.1	16.7	16.0	0.0	21.5	
3. Severe hindrance	71.0	91.7	53.3	73.7	100.0	66.7	61.9	83.3	84.0	66.7	74.9	
C. Production technology												198
1. Slight hindrance	10.8	8.3	13.3	15.4	0.0	33.3	37.5	30.0	8.0	25.0	18.2	
2. Moderate hindrance	48.6	58.3	40.0	53.8	100.0	66.7	50.0	53.3	60.0	75.0	54.5	
3. Severe hindrance	40.5	33.3	46.7	30.8	0.0	0.0	12.5	16.7	32.0	0.0	27.3	
D. Availability of on-farm equipment												200
1. Slight hindrance	7.9	8.3	6.7	20.5	0.0	33.3	16.0	13.3	24.0	50.0	15.5	
2. Moderate hindrance	42.1	25.0	53.3	43.6	83.3	50.0	60.0	63.3	36.0	50.0	48.5	
3. Severe hindrance	50.0	66.7	40.0	35.9	16.7	16.7	24.0	23.3	40.0	0.0	36.0	
E. Investment costs required												200
1. Slight hindrance	2.6	0.0	0.0	12.8	0.0	0.0	4.2	3.3	0.0	50.0	5.0	
2. Moderate hindrance	50.0	8.3	33.3	35.9	16.7	50.0	50.0	50.0	56.0	50.0	43.5	
3. Severe hindrance	47.4	91.7	66.7	51.3	83.3	50.0	45.8	46.7	44.0	0.0	51.5	
F. Storage and marketing facilities												199
1. Slight hindrance	2.6	0.0	0.0	5.3	0.0	0.0	0.0	0.0	4.0	25.0	3.0	
2. Moderate hindrance	28.9	8.3	20.0	23.7	16.7	0.0	32.0	30.0	28.0	50.0	25.6	
3. Severe hindrance	68.4	91.7	80.0	71.0	83.3	100.0	68.0	70.0	68.0	25.0	71.4	

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Table 2 (continued)

Question-answer category	Percentage of times a particular answer was selected within each land resource area: 122[1/]	123	125	128	128a	129	130	133	134[2/]	135	201-county region	Total No. of counties responding
Question 7: In your county, how effective do you think a few farm enterprise demonstrations (carried out cooperatively by the Agricultural Extension Service and TVA) would be as an educational and promotional tool in liquid fuel crop production?												
Answers:												199
A. None to slightly	18.4	16.7	13.3	18.4	16.7	16.7	36.0	16.7	20.0	0.0	19.6	
B. Moderately	71.1	58.3	60.0	60.5	50.0	66.7	48.0	63.3	56.0	50.0	60.3	
C. Highly	10.5	25.0	26.7	21.1	33.3	16.7	16.0	20.0	24.0	50.0	20.1	
Question 8: How much interest is there among farmers in your county for growing vegetable oil crops (such as soybeans, sunflowers, and peanuts) to produce oil for on-farm direct combustion in diesel engines?												
Answers:												199
A. None to slight	50.0	16.7	60.0	66.7	100.0	71.1	80.0	43.3	44.0	0.0	55.8	
B. Moderate	42.1	58.3	33.3	33.3	0.0	23.7	20.0	53.3	40.0	75.0	36.7	
C. Much	7.9	25.0	6.7	0.0	0.0	5.3	0.0	3.3	16.0	25.0	7.5	
Question 9: What proportion of the farmers in your county do you estimate are practicing adequate soil conservation in their farming operations?												
Answers:												199
A. 10%	15.8	0.0	26.7	5.3	0.0	0.0	0.0	36.7	20.0	25.0	14.6	
B. 25%	31.6	8.3	13.3	34.2	66.7	33.3	28.0	23.3	32.0	50.0	29.1	
C. 50%	42.1	33.3	33.3	28.9	33.3	33.3	32.0	36.7	40.0	25.0	35.2	
D. 75%	10.5	50.0	26.7	28.9	0.0	33.3	32.0	3.3	4.0	0.0	18.6	
E. 90%	0.0	8.3	0.0	2.6	0.0	0.0	8.0	0.0	4.0	0.0	2.5	

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Table 2 (continued)

Question-answer category	Percentage of times a particular answer was selected within each land resource area: 122[1]	123	125	128	128a	129	130	133	134[2]	135	201-county region	Total No. of counties responding
Question 10: Among farmers in your county, how much interest is there in adoption of crop management systems involving zero or minimum tillage of row crops?												
Answers:												196
A. None to slight	5.7	8.3	20.0	13.2	16.7	0.0	20.0	26.7	8.0	25.0	14.3	
B. Moderate	82.9	66.7	60.0	73.7	66.7	50.0	72.0	73.3	44.0	75.0	68.9	
C. Much	11.4	25.0	20.0	13.2	16.7	50.0	8.0	0.0	48.0	0.0	16.8	
Question 11: Do you know of any farmers in your county who would be interested in producing fuel (alcohol or vegetable oil) on a cooperative, demonstrational basis with the Agricultural Extension Service and TVA?												
Answers:												192
Yes	55.6	75.0	53.3	54.1	50.0	66.7	54.2	53.3	45.5	100.0	55.7	
No	44.4	25.0	46.7	45.9	50.0	33.3	45.8	46.7	54.5	0.0	44.3	

[1] Also includes three counties of land resource area 120.
[2] Also includes two counties of land resource area 131.
[3] Estimated at about one-third more net income per acre.
[4] One county estimated 10-20% more net income per acre.
[5] One county reported over 100% more net income per acre.
[6] Estimated at 5% or less.
[7] One county estimated less than 10%.
[8] One county estimated 100%.

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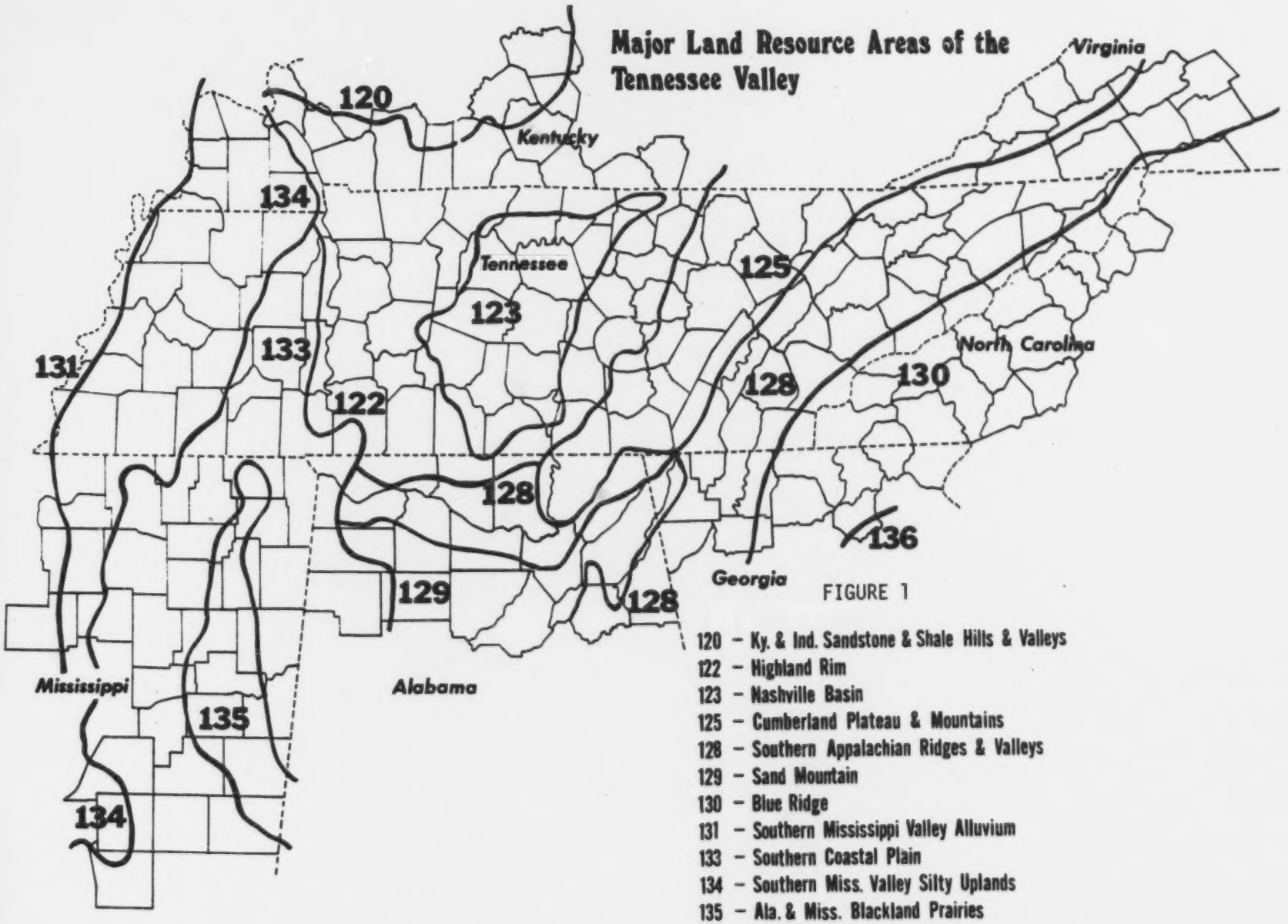

FIGURE 1

120 – Ky. & Ind. Sandstone & Shale Hills & Valleys
122 – Highland Rim
123 – Nashville Basin
125 – Cumberland Plateau & Mountains
128 – Southern Appalachian Ridges & Valleys
129 – Sand Mountain
130 – Blue Ridge
131 – Southern Mississippi Valley Alluvium
133 – Southern Coastal Plain
134 – Southern Miss. Valley Silty Uplands
135 – Ala. & Miss. Blackland Prairies
136 – Southern Piedmont

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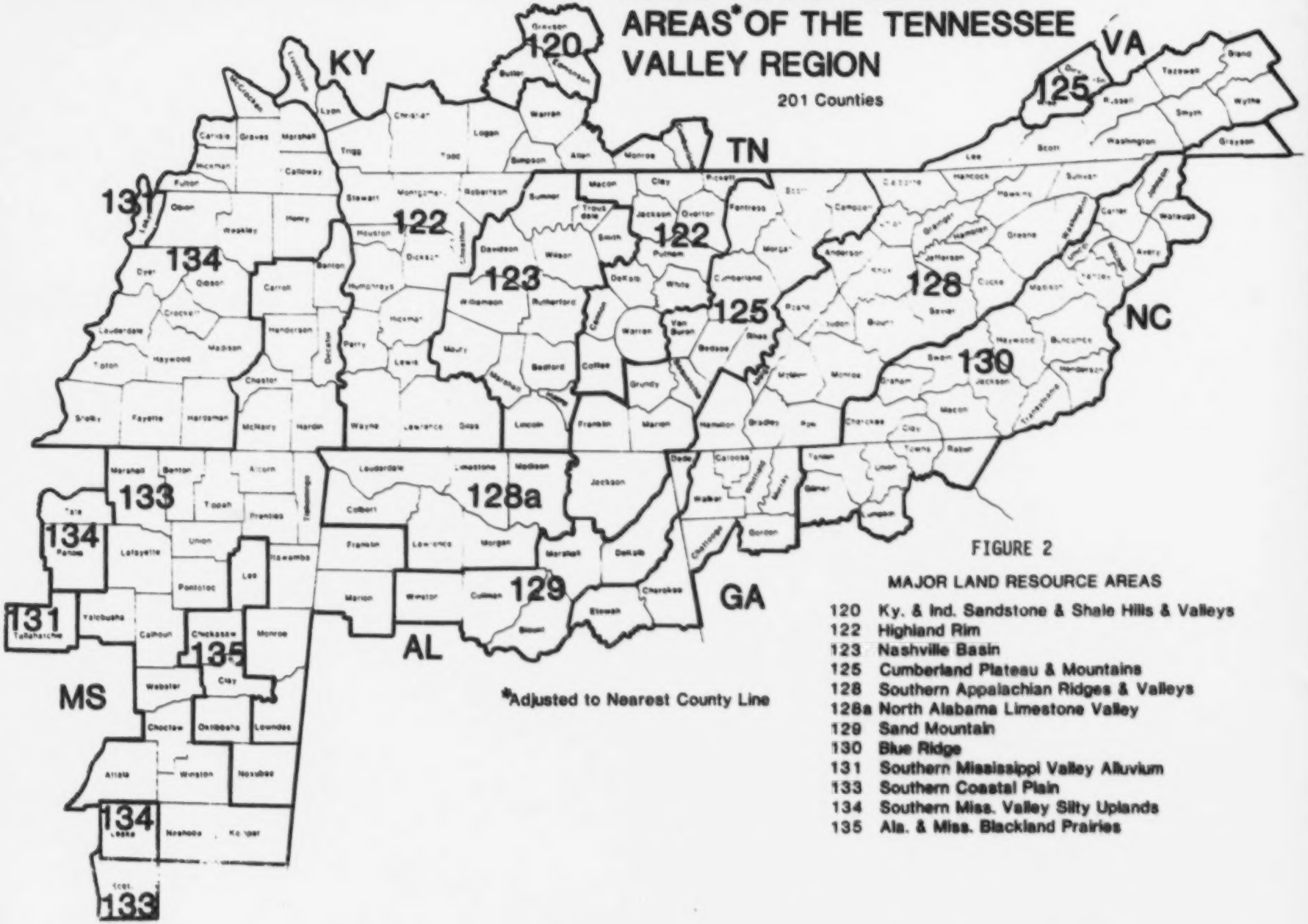
MAJOR LAND RESOURCE AREAS* OF THE TENNESSEE VALLEY REGION

201 Counties



*Adjusted to Nearest County Line

FIGURE 2

MAJOR LAND RESOURCE AREAS

120	Ky. & Ind. Sandstone & Shale Hills & Valleys
122	Highland Rim
123	Nashville Basin
125	Cumberland Plateau & Mountains
128	Southern Appalachian Ridges & Valleys
128a	North Alabama Limestone Valley
129	Sand Mountain
130	Blue Ridge
131	Southern Mississippi Valley Alluvium
133	Southern Coastal Plain
134	Southern Miss. Valley Silty Uplands
135	Ala. & Miss. Blackland Prairies

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COUNTY SURVEY ON POTENTIAL PRODUCTION OF AGRICULTURAL CROPS FOR LIQUID FUEL

(Survey form to be completed by County Extension Agent or other official with knowledge of agricultural crop production and farmer preferences within the assigned county. A consensus from several local agricultural leaders may be used.)

County _____ State _____
Prepared by _____ Title _____
Address _____ Phone No. _____

Please place a check mark in the blank of the most appropriate answer.

1. In your best judgment, with present-day farm commodity prices and technology, how much interest is there among farmers of your county in growing crops such as sweet sorghum, sweet potatoes, sugarbeets, and oil seeds for liquid fuel (alcohol and vegetable oil) production?

   A. ___ None B. ___ Slight C. ___ Moderate D. ___ Much

   Comments (if any): _____
   _____
   _____

2. Assuming future advancements in technology and farm commodity price changes, how much more net income per acre would be required for most farmers in your county to convert their present cropland from conventional food and fiber crops to liquid fuel crops?

   A. ___ Same net income B. ___ 10% more C. ___ 25% more

   D. ___ 50% more E. ___ 100% more F. ___ _____% more (specify)

3. At the present time, how important are each of the following factors as a hindrance for growing crops for liquid fuel production in your county?

Factor	Degree of Hindrance		
	Slight	Moderate	Severe
A. Farmer interest or preference	_____	_____	_____
B. Uncertainty of economic return	_____	_____	_____
C. Production technology	_____	_____	_____
D. Availability of appropriate on-farm equipment	_____	_____	_____
E. Investment costs required	_____	_____	_____
F. Storage and marketing facilities	_____	_____	_____
G. Other (specify) _____	_____	_____	_____

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4. In your best judgment, how much unused or underused openland in your county is suitable and available for production of fuel crops mentioned in question 1? (Estimate acreage available for more intensive crop production without significantly decreasing the present acreage of food and fiber crops.)

A. ___ Less than 2,000 acres
B. ___ 2,000 to 8,000 acres
C. ___ 8,000 to 15,000 acres
D. ___ 15,000 to 25,000 acres
E. ___ 25,000 to 40,000 acres
F. ___ _____ acres
specify

5. Approximately what proportion of farmers in your county would be receptive to government incentive programs that would encourage the production of liquid fuel crops on cropland, with certain soil-conserving restrictions?

A. ___ 10% B. ___ 25% C. ___ 50% D. ___ 75% E. ___ _____%
specify

6. Approximately what proportion of farmers in your county would be receptive to government incentive conservation and production programs that would allow for use of steeper, more erosive, or less productive land for fuel crops, while preventing the planting of fuel crops on prime farmland?

A. ___ 10% B. ___ 25% C. ___ 50% D. ___ 75% E. ___ _____%
specify

7. In your county, how effective do you think a few farm enterprise demonstrations (carried out cooperatively by the Agricultural Extension Service and TVA) would be as an educational and promotional tool in liquid fuel crop production?

A. ___ None to slightly B. ___ Moderately C. ___ Highly

8. How much interest is there among farmers in your county for growing vegetable oil crops (such as soybeans, sunflowers, and peanuts) to produce oil for on-farm direct combustion in diesel engines?

A. ___ None to slight B. ___ Moderate C. ___ Much

9. What proportion of the farmers in your county do you estimate are practicing adequate soil conservation in their farming operations?

A. ___ 10% B. ___ 25% C. ___ 50% D. ___ 75% E. ___ 90%

10. Among farmers in your county, how much interest is there in adoption of crop management systems involving zero or minimum tillage of row crops?

A. ___ None to slight B. ___ Moderate C. ___ Much

11. Do you know of any farmers in your county who would be interested in producing fuel (alcohol or vegetable oil) on a cooperative, demonstrational basis with the Agricultural Extension Service and TVA?

___ Yes ___ No. If answer is yes, how many? _____

12. Additional comments (if any):

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Some Specific Comments by County Respondents

Present Interests and Concerns in Growing Liquid Fuel Crops

(See Appendix A questions 1 and 12.)

Alabama counties:

- Most farmers do not know enough about the subject to make a decision one way or the other.
- A constant market place would be the determining factor.
- Two years ago a lot of interest was generated but has died out.
- Most of our farmers are in a financial bind and are not anxious to get into something that is so uncertain.
- Cull irish potatoes could be used.
- If a good market was available, grower interest would be high. A lot of producers are looking for alternative, rotational crops.
- Farmers are very interested in fuel production but they aren't thinking in terms of sweet sorghum, sweet potatoes, or sugarbeets.
- The production of crops for fuel production must be started--some type of incentive with a guaranteed return--risk is too great to produce for an unknown.
- I would be willing to assist in some of these demonstration programs. They would have to be limited acreage with some type of guarantee that the producer would not lose money on the planted crop.

Georgia counties:

- Interest is slight due to lack of knowledge.
- No interest at present but this could change as economic conditions change.
- Nobody has really been approached by the idea.
- I think the greatest drawback to fuel oil production in Dade County is a lack of knowledge and an "unknown" market outlet. I do feel that the use of certain equipment already in use by farmers could be modified slightly to be used for fuel oil crop production (corn producers converting to sunflowers and/or irish potatoes to sweet potatoes).
- There is definite interest in Towns County and any progress would indeed be appreciated.

Kentucky counties:

- Only heard one or two farmers talk about this. They talked about alcohol from corn.
- Price would be determining factor along with size of fields and cost of harvesting.
- Primary interest (Hickman County): (1) use of grain in fuel production, and (2) farm scale liquid fuel production units.
- Interest has waned. There was quite a lot of interest 15 months ago in gasohol production.

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Specific Comments (continued)

Mississippi counties:

- Probably lots of farmers interested in production of oil crops, but we have no idea as to income per acre, etc. When we get details, I believe there will be lots of interest.
- We have 400 small farmers that would grow, in my opinion, a raw fuel crop under economical conditions.
- I believe the limiting factor in a project such as this is what we do not know about fuel crops and appropriate marketing outlets. If the market was developed, I feel we would have a great interest in growing these crops.

North Carolina counties:

- Interest is very limited at present.
- How much potential return? If promising economic returns. Yes.
- Inadequate land to produce crops for fuel.
- No interest at present. However, there may be interest if the profit is great enough for the investment.
- I need returns for investment.
- We have little acreage suitable for mechanized agriculture production to compete with other areas more topographically suited to field crops.
- In my opinion, this survey should be geared to crops that have an absolute geographic advantage (especially hardwood biomass) in the mountain counties which have a high percentage of forest acreage, but relatively low percentages of good cropland (land classes 1-3).
- Research should be inititated to utilize our natural resources rather than relocated crops that have never or probably will not hold a potential place in mountain agriculture.
- Some feasibility questions have been asked.

Tennessee counties:

- If there was a market for their crop and enough production practices available I believe a few farmers would be interested in improving their net income.
- They will not speculate, especially following a dry summer like 1980.
- Several months ago interest seemed to be running higher than at present.
- The farmers have not been contacted on this subject. I believe there is some interest in the production of fuel crops but I do not know how much.
- Many farmers have little faith in such fuels due to experience with gasohol etc., cost of production and his neighbor's opinion.
- We need an alternate crop but ease of soybean production and price has prevented much interest.

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Specific Comments (continued)

Tennessee counties (continued):

- Farmers do not approve restriction generally and find some way to get around them. If soybeans are such a crop I know this would be impossible.
- . . .Two farmers now have experimental permits for alcohol production (Dyer County).
- Interest would develop quickly if proper or suitable markets were available.
- Some interest has been shown in sunflower production as an oil crop (Giles County).
- More information needed.
- With tobacco receiving adverse publicity many farmers are looking for other cash crops.
- Net profit per acre, amount of storage and equipment necessary would determine how many people would grow these crops.
- If crop values were high enough farmers can and would grow these crops.
- We would certainly have more interest if producers know what markets were available.
- Producers are very skeptical about new enterprises. Before producers are encourage to produce, markets and some guarantee of prices have to be made by reputable backing.
- Farmers have had markets set up in the past for specialty crops like peppers, and just as they were geared up for production, the market would play out.
- Improvement in net return over other conventional crops would have to be a potential.
- In 1980 the local extension agent (Lake County) with the cooperation of one producer conducted a test demonstration plot involving 4 varieties of sugarbeets for manufacturing of liquid fuel. In 1981 a similar test demonstration plot will be grown involving Jerusalem artichokes.
- Oil seeds would get most response. Specialized equipment that would have to be purchased would be a factor.
- Markets, a satisfactory margin of profitability, and available technology and equipment are all that is needed to acquire interest, land, and production by farmers.
- Net returns do not justify--not deemed economical at present.
- Farmers would be interested if the profit would be more than traditional crops.
- (Morgan County): (1) The former extension leader worked with one individual obtaining information on a small alcohol production plant. (2) I have worked with two coal brokers who were interested in putting up a plant that would produce 1-2 million gallons of alcohol. The University of Georgia did the feasibility study and I provided some of the back-up information. These brokers want to utilize coal as the source of energy. (3) The Morgan County Resource

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Specific Comments (continued)

Tennessee counties (continued):

Development Council is looking at the possibility of locating a plant in the western part of the county where there is an abundance of natural gas. It is estimated that we would need to produce an extra 7,000 acres of corn.

- If markets become available the attitude toward production would be more favorable.
- Very little effort has been made to publicize it or even conduct a survey. Returns per acre are not known to us.
- . . .labor would be a problem. Profit is the key to the production of crops, for any purpose.
- Labor consideration would be an important factor.
- High cost to adequately mechanize for production of crops has been voiced a serious drawback by our farmers. Example: principal and interest to produce these crops and then where to sell.
- (Stewart County): There was a farmer who tried to interest others in producing gasohol. He got no interest even after running articles in the county newspaper and talking with individuals. He has since moved to Alabama where he is currently making fuel from sweet potatoes.
- Whether they will remain interested or not depends on how much financial help they could get, plus how much "red tape" is involved in setting up these demonstration programs. If it happens, the agreements need to be straight-forward, simple, and provide substantial financial incentive.
- Commodity price is important to justify enterprise involvement.
- Farmers desire a satisfying net return from an enterprise with a minimum amount of government control.

Virginia counties:

- Limited cropland is an obstacle in Grayson County--95 percent of all corn grown is harvested as silage to support beef and dairy operations (can graze more cattle than can produce winter feed).
- Would be more interest in dairymen producing methane from manure waste system (Grayson County).
- There are one or two farmers (in Smyth County) who have permits for producing alcohol.
- If some of the farmers were approached about demonstrations, I am sure they would cooperate.
- Several farmers have inquired about sugarbeets, cane sorghum, and sunflowers. Some farmers will be very interested in producing if a profitable market can be established. Some farmers will produce limited acreage without profitable market.
- In the past year only two people have expressed an interest in alcohol production. We have provided the information, but further requests have not been received (Wise County).
- . . .I assume there might be some interest in growing corn or some grain for gasohol production.

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